

CLAIMS

We claim:

1. A method for controlling a population of target insects, comprising:
 - (i) providing a gene comprising a coding sequence encoding one constituent of an enzyme/pro-pesticide system and a regulatory region operatively linked to said coding sequence; wherein said regulatory region regulates expression of said coding sequence in a target insect of said population of target insects in a sex specific manner;
 - (ii) transforming a plurality of said target insects with said gene, and allowing said gene to spread within the target insect population; and
 - (iii) administering to said population of target insects the remaining constituent(s) of said enzyme/pro-pesticide system,

wherein said enzyme catalyzes the conversion of the pro-pesticide to a pesticide.
2. The method of claim 1, wherein said coding sequence is expressed only in male target insects.
3. The method of claim 1, wherein said coding sequence is expressed only in female target insects.
4. The method of claim 1, wherein said coding sequence encodes an enzyme which converts a pro-pesticide into its active metabolite.
5. The method of claim 1, wherein said coding sequence encodes an amidase enzyme which converts a pro-pesticide into its active metabolite.
6. The method of claim 1, wherein the coding sequence encodes a mixed functional oxidase/cytochrome P450 which converts a pro-pesticide into its active metabolite.
7. The method of claim 1, wherein the coding sequence encodes an esterase enzyme which converts a pro-pesticide into its active metabolite.
8. The method of claim 1 wherein said coding sequence encodes cytosine deaminase.
9. The method of claim 1 wherein the coding sequence encodes β -glucuronidase.
10. The method of claim 4 wherein said pro-pesticide comprises an organophosphate, a phosphoramide, a neonicotinoid, or an oxadaizine derivative.
11. The method of claim 1, wherein said enzyme/pro-pesticide system comprises:
 - (i) acephate or an analogue of acephate; and

A. COMPOSITIONS

(ii) an amidase that converts acephate or an analogue of acephate to its active metabolite methamidophos.

12. The method of claim 1, wherein said enzyme/pro-pesticide system comprises:

(i) N-Me-imidacloprid or an analogue of N-Me-imidaclopride; and

(ii) a mixed functional oxidase/cytochrome P450 that converts N-Me-imidacloprid or an analogue of N-Me-imidacloprid to its active metabolite imidacloprid.

13. The method of claim 1, wherein said enzyme/pro-pesticide system comprises:

(i) DPX-JW062 or an analogue of DPX-JW062; and

(ii) an esterase that converts DPX-JW062 or an analogue of DPX-JW062 to its active metabolite.

14. The method of claim 8 wherein said enzyme/pro-pesticide system further comprises 5-FC.

15. A vector which transforms a target insect cell,
wherein said vector comprises a gene comprising a coding sequence encoding one constituent of an enzyme/pro-pesticide system and a regulatory region operatively linked to the coding sequence;
wherein said regulatory region regulates expression of said coding sequence in a target insect cell in a sex specific manner;
and wherein said enzyme catalyzes the conversion of said pro-pesticide to a pesticide.

16. A vector which transforms a target insect cell,
wherein said vector comprises a gene comprising a coding sequence encoding one constituent of an enzyme/pro-pesticide system and a promoter operatively linked to the coding sequence;
wherein said promoter regulates expression of said coding sequence in said target insect cell in a sex-specific manner;
and wherein said enzyme catalyzes the conversion of said pro-pesticide to a pesticide.

17. The vector of claim 15 wherein said vector is a transposon.

18. The vector of claim 16 wherein said vector is a transposon.

19. The transposon of claim 17 wherein said transposon is Minos.

20. The transposon of claim 18 wherein said transposon is Minos.

21. The method of claim 1 wherein said target insect of said population of target insects is *Ceratitis capitata*.

22. The vector of claim 16, wherein said promoter is a *Ceratitis capitata* yolk protein gene promoter.

23. A male or female insect, which insect has been transformed with a gene comprising a coding sequence encoding one constituent of an enzyme/pro-pesticide system, and a promoter that is operatively linked to said coding sequence;
wherein said promoter regulates expression of said coding sequence such that said coding sequence is only expressed in insects of the opposite sex; and
wherein said enzyme catalyzes the conversion of said pro-pesticide to a pesticide.

24. The insect of claim 21 wherein said insect is a male insect.

25. The male insect of 22 wherein said male insect is irradiated for applications in sterile insect technique.

26. The male insect of claim 23 wherein said insect is *Ceratitis capitata*.